

PRACTICAL-7

Aim:- Implement hello world using quantum computer

Unlike classical computers, quantum computers don't have a simple "print" operation. Quantum computers work with **qubits**, **superposition**, and **quantum gates**.

Hello World in quantum computing typically means:

- Preparing a quantum circuit.
- Running a basic operation (like flipping a qubit).
- Measuring the output to get a classical result.
- Showing that the quantum program ran successfully.

The most basic "Hello World" quantum program involves:

- Initializing qubits.
- Applying a **Hadamard Gate** (creates superposition).
- Measuring the qubits.
- Printing the output.

We usually use **IBM's Qiskit** (Python library) to run this locally or on IBM's real quantum computers.

Steps:-

1. Install Qiskit

- Install the Qiskit library using pip.

2. Import Required Libraries

- Import QuantumCircuit, Aer, and execute modules.

3. Create a Quantum Circuit

- Initialize 1 or more qubits.
- Apply a Hadamard gate to create superposition.

4. Add Measurement

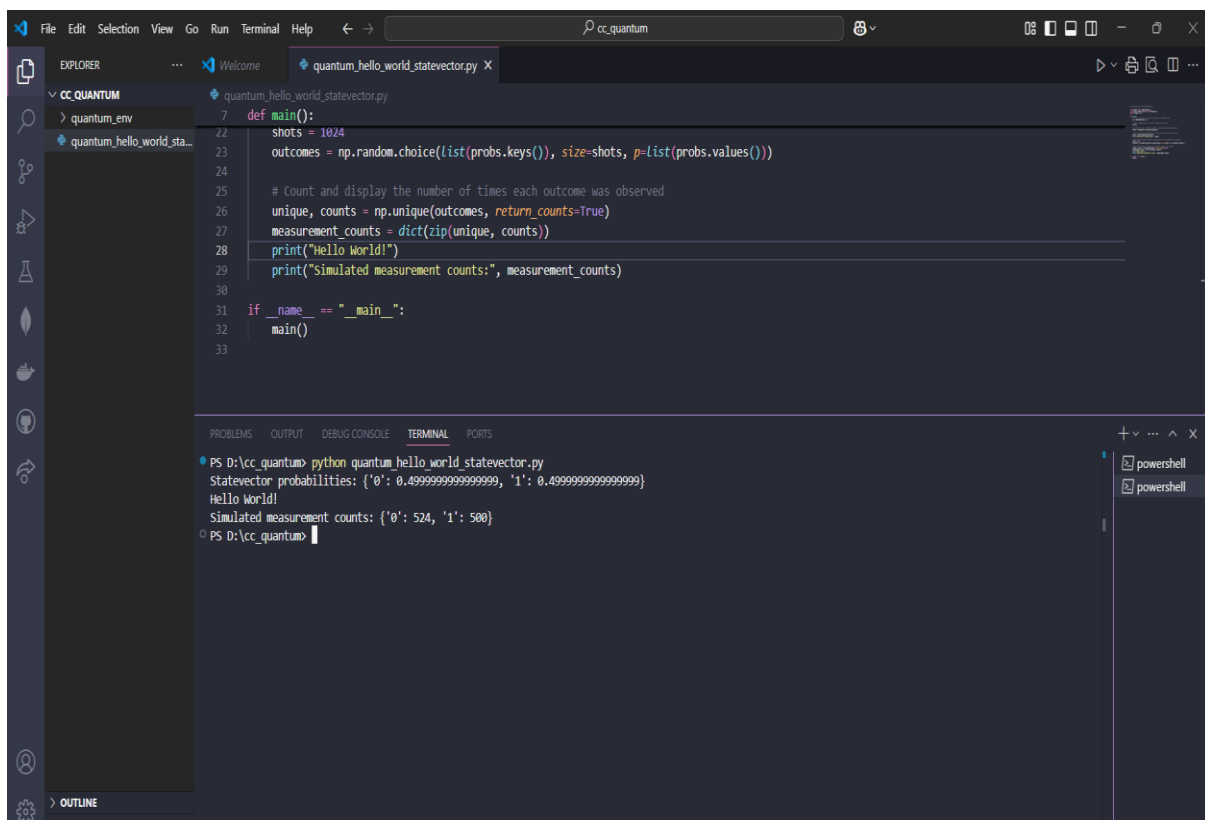
- Measure the qubits and store the result.

5. Simulate the Circuit

- Use a local simulator (Aer) to run the quantum circuit.

6. Print the Results

- Display the result, which shows the probabilities of different outcomes (like "0" or "1").



The screenshot shows a Visual Studio Code editor window with a Python file named `quantum_hello_world_statevector.py`. The code defines a `main` function that simulates a quantum circuit with 1024 shots. It uses `np.random.choice` to generate outcomes based on statevector probabilities. The output shows the statevector probabilities for '0' and '1', a "Hello World!" message, and the simulated measurement counts for '0' (524) and '1' (500).

```
7 def main():
22     shots = 1024
23     outcomes = np.random.choice(list(probs.keys()), size=shots, p=list(probs.values()))
24
25     # Count and display the number of times each outcome was observed
26     unique, counts = np.unique(outcomes, return_counts=True)
27     measurement_counts = dict(zip(unique, counts))
28     print("Hello World!")
29     print("Simulated measurement counts:", measurement_counts)
30
31 if __name__ == "__main__":
32     main()
33
```

Terminal Output:

```
PS D:\cc_quantum> python quantum_hello_world_statevector.py
Statevector probabilities: {'0': 0.49999999999999999, '1': 0.49999999999999999}
Hello World!
Simulated measurement counts: {'0': 524, '1': 500}
PS D:\cc_quantum>
```